

Report of the Tropospheric Working Group for 2002

Gerd Gendt

GeoForschungsZentrum Potsdam, Division Geodesy and Remote Sensing,
Telegrafenberg A17,
D-14473 Potsdam, Germany; e-mail: gendt@gfz-potsdam.de

Weekly Combined Tropospheric Product and Densification

The quality and consistency of the IGS Final weekly combined tropospheric product (Gendt, 1996) has steadily improved during its more than 6 year history. The comparisons between the individual Analysis Center (AC) solutions and the IGS official combined solution are shown in Figure 1. All but one AC agree within 3 mm standard deviation since week 1180 (August 2002), for most ACs even at the 2 mm level. This corresponds to a quality of better than 0.5 mm in the precipitable water vapor.

The bias changes at individual ACs caused by changes in their analysis strategy are even smaller, and in total they are usually in the ± 2 mm band. The only exception in the bias stability seen for ESA, where a pronounced seasonal effect can be observed, the origin of that is not clear. The consistency between the ACs having the smallest standard deviations agree best. It is during the last years even at the ± 1 mm level. Those good ACs have the highest weight in the combination so that the expected bias changes in the combined solution are smaller than ± 1 mm.

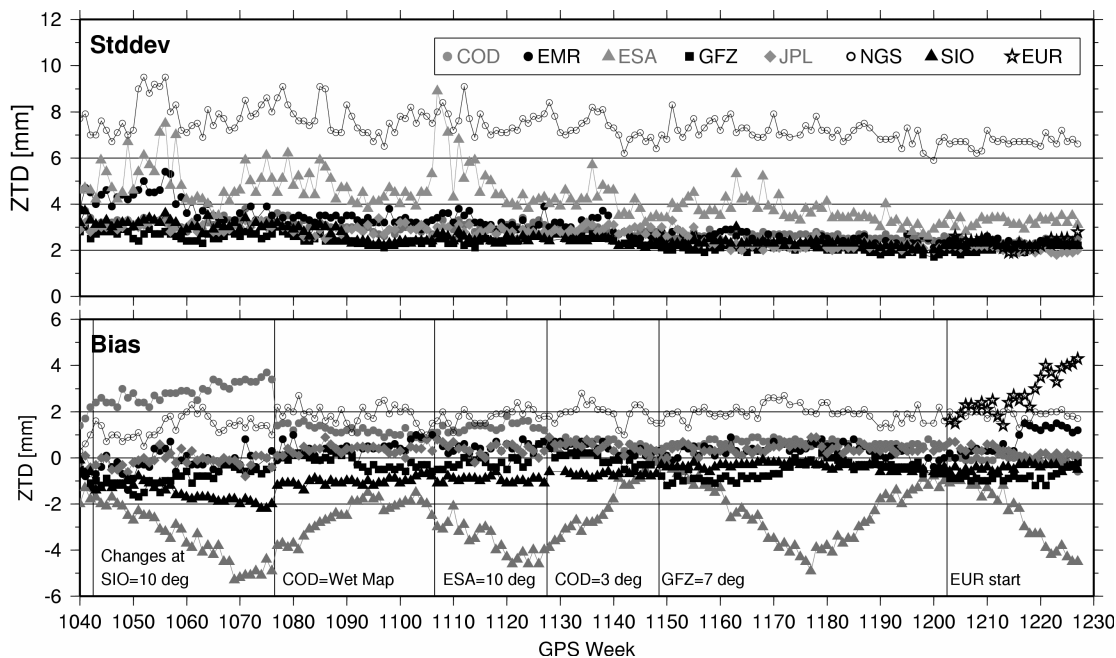


Fig. 1. Standard deviation and bias in the neutral zenith total delay between the individual Analysis Center estimates and the IGS Combined Product. Mean values (over all sites) per week and per Analysis Center.
(GPS Week 1042.6 = 2000.0)

In June 2001 the EUREF community has started a Pilot Experiment for the generation of tropospheric products. The solution is a combination of 15 individual EUREF ACs and comprises a European network of about 150 sites. After a short test phase in 2001 (Gendt 2002) an official EUREF (abbreviation: EUR) submission was included into the IGS combination starting in February 2002 (GPS week 1203). The standard deviation of the EUREF solution has the same level as seen for the best single IGS ACs. The bias seems to change with time, however, the time interval is yet too short for a final assessment. By this regional densification the number of sites included in the IGS Tropospheric Product has grown from 180 to 280.

During the last one and a half year also the number of collocated meteorological sensors have improved significantly (Fig. 2). However, especially in the tropical region, where the water vapor in the atmosphere is most interesting to monitor, a need of additional sensors is obvious (Fig. 3).

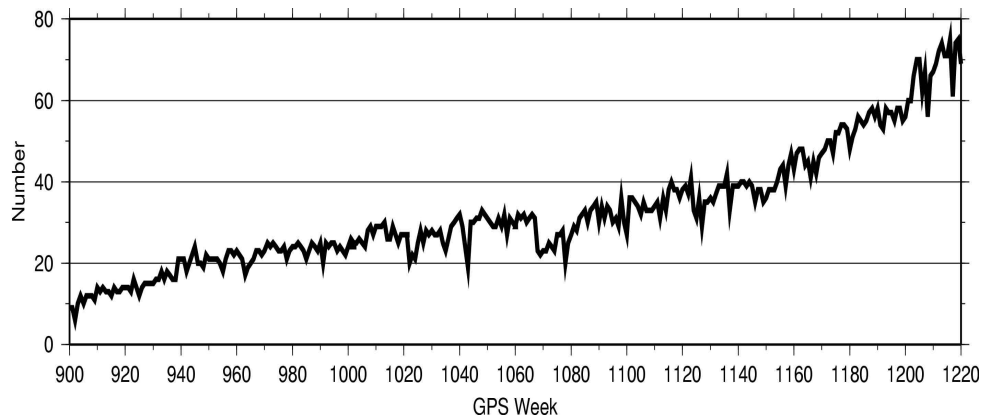


Fig. 2. Number of sites with collocated meteorological sensors

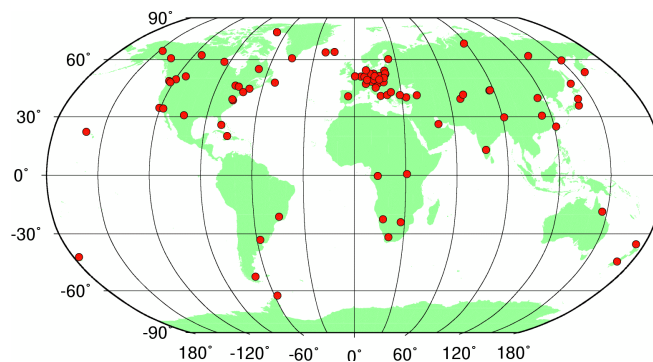


Fig. 3. Network of collocated meteorological sensors

Table 1. Summary on Analysis Center contributions to NRT Trop Pilot Experiment

| AC | Submission rate | No. stations | Delay[h] | Start of submission |
|------|-----------------|--------------|----------|---------------------|
| CODE | 12h | 70 | 2:00 | 07/2003 |
| EMR | 3h | 40 | 1:30 | 06/2001 |
| GFZ | 3h | 50 | 1:15 | 06/2001 |
| ESA | 12h | 40 | 2:00 | 07/2001 |
| SIO | 3h | 40 | 2:30 | 08/2001 |
| USNO | 3h | 35 | 1:30 | 09/2001 |
| JPL | Real-time | 60 | 0 | 11/2001 |
| GOP* | 3h | 60 | 2:00 | 02/2002 |

* GOP- Geodetic Observatory Pecny, EUREF Analysis center

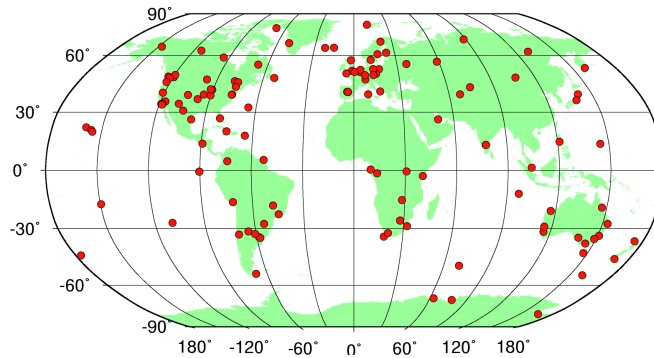


Fig. 4. Network of stations with NRT tropospheric products

Near-Real-Time Product

After a Pilot Experiment starting in June 2001 the IGS is generating a near real-time (NRT) tropospheric product using the global hourly station network. Every three hours a product for the last 12 hours is combined by all individual submissions of up to 8 ACs. Some statistics for the contributing ACs are summarized in Table 1. The product is available with a delay of about 2.5 hours and comprises more than 140 stations (Fig. 4). The consistency of the product is at the level of ± 2 to 4 mm ZTD as already demonstrated in 2001 (see Gendt, 2002).

Summary

Progress was made since the last annual report in the densification of the Final product by inclusion of the high quality EUREF combined tropospheric product.

The NRT products were regularly generated with a high reliability (about 99% availability) since two years now.

The quality of the IGS combined products – both the Final and the NRT – corresponds to better than 1 mm in the water vapor content.

References

- Gendt, G (1996): Comparison of IGS tropospheric estimates. Proceedings IGS Analysis Center Workshop, 19-21 March 1996 Silver Spring, Maryland USA, Eds. R E Neilan, P A Van Scoy, J F Zumberge, pp. 151-164
- Gendt, G. (2002): Report of the Tropospheric Working Group for 2001. The IGS 2001 Technical Reports, in press.